OPERATING
INSTRUCTIONS
3825.8

INSTALLATION OPERATING AND MAINTENANCE MANUAL

KINNEY
KV
EVERYTHING IN VACUUM

THERMO-COUPLE VACUUM GAUGE SERIES KTG

KINNEY VACUUM DIVISION
THE NEW YORK AIR BRAKE COMPANY
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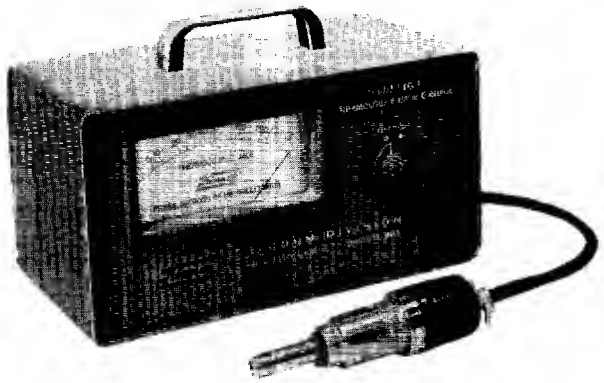
SERIES KTG THERMOCOUPLE VACUUM GAUGE

DESCRIPTION



The KINNEY Thermocouple Vacuum Gauge is an instrument for reading the total pressure of condensable vapors and permanent gases within the range of 3000 microns to one micron. The gauge control is precalibrated and all gauge tubes are matches thus enabling the user to obtain pressure readings from any KINNEY gauge control at any control position without having to reset circuit values or refer to individual gauge tube characteristics.

The unit is housed in a grey hammertone-finish cabinet with a carrying handle. The meter is edge-lit for easy reading. It is available in one through six station standard models, portable, or with a standard 19-inch panel mount. All units use a single meter plus a tube and eight-foot cord for each station. General specifications for the gauge are given in Figure 1.

All multi-station units have a stand-by (pre-warm) circuit which enables rapid readings to be made when switching from station to station.

The KTG Gauge Series features printed circuit wiring and a transistorized control circuit for reliability, compactness, weight reduction, and lower power consumption. The entire printed circuit board is easily removed for testing or replacing components. The unit has exceptionally fast response to pressure changes (1/2 second or less). The absolute accuracy and reproducibility of the gauge is approximately ±10% at 50 microns.

The gauge tube has a standard octal base and a threaded 1/8-inch NPT nipple for connection to the vacuum system. A compression fitting can also be used to connect the gauge tube to the system. The KINNEY Gauge Tube utilizes a chromel/cupron couple and tungsten wire heater.

THEORY OF OPERATION

The thermocouple gauge control supplies a constant current to the heater of the thermocouple gauge tube. The temperature of the heater (a function of pressure) is sensed by the thermocouple junction in the gauge tube and is indicated by the meter on the gauge control.

The constant current supply for the thermocouple gauge heater is of the series regulator type. Figure 2 is a simplified diagram of the current regulator. Current regulation is accomplished as follows. The Zener diode, CR, keeps the base of transistor Q at a constant negative voltage with respect to the positive terminal of the power supply. Resistor R is set so that with the base Q at the voltage determined by CR, the correct current flows through the thermocouple heater. If the current through the heater and R should increase, the voltage at the emitter will become more negative with respect to the base. Making the emitter of Q more negative with respect to the base causes the transistor to conduct less, thus forcing the heater current back to its correct value. If the heater current decreases, the transistor conducts more and so corrects the error.

On multiple-station gauge controls a warming circuit keeps the unused heaters at approximately the correct temperature. This warming circuit is merely a low ac. voltage with a resistor in series to limit the current through the unused heaters.

(See Adjustment of Pre-Warm Circuit.)

GAUGE CONTROL	Cabinet Unit	Panel Mounted Unit
Height	5-3/4"	5-1/4"
Width	9-1/8"	19"
Depth *	5-1/2"	5-1/2"
Weight (net)	6 lbs.	7 lbs.
GAUGE TUBE		
Length	4"	
Envelope O. D.	1-1/4"	
Tubulation O. D.	.405"	
Tubulation Length	1-1/4"	
Envelope Material	Steel	
Tubulation Connection	1/8" NPT Nipple	
Gauge Tube Cord Connection	Octal (Male)	
GAUGE TUBE CORD		
Length **	8' std.	
Gauge Tube Connection	Octal Connector (Male)	
Gauge Control Connection	Four Pin Miniature	
POWER SUPPLY REQUIRED		
95 to 140 volts, 50/60 cycle, ac.		

*Without tube cords plugged into back of gauge control.

**Gauge tube cords can be supplied up to 400 feet long. On multi-station units, all cords must be the same length.

Figure 1. General Specifications.

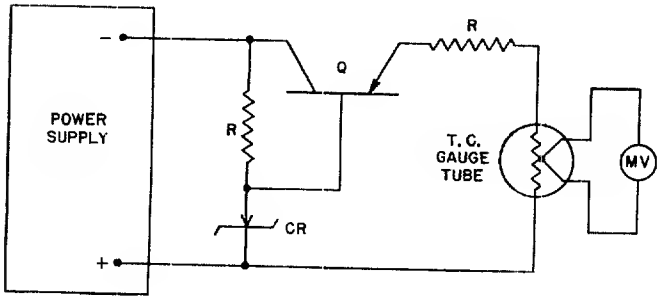


Figure 2. Simplified Schematic of Heater Current Regulator.

INSTALLATION

Attach the thermocouple gauge tubes to the vacuum system by either screwing them into mating 1/8-inch female pipe fittings (after having coated the male threads with a vacuum sealer such as Kinseal or winding them with Teflon tape) or by inserting them into compression fittings. The compression fittings can be assemblies with either O-rings or some other elastomer bushings. Apiezon sealer, certain hard waxes, or soft soldering may also be used. The latter methods, however, are not recommended due to difficulty of application and unreliability. The best mounting position for the tubes is vertical with the octal connection end upward to minimize the accumulation of liquids and particles which cause reading errors.

After the tubes have been installed, connect the cords between the tubes and the gauge control unit.

CAUTION

Rough or careless handling of gauge tubes may result in permanent damage.

OPERATION

Since commercial meters have minute amounts of residual pivot friction, the most accurate reading of the meter pointer can be ascertained by giving the meter case a light tap with the finger. On some occasions, a slight displacement of the pointer may occur; this is the true position of the pointer.

Because small currents and low voltages are typically encountered in thermocouple circuits, contact resistance in the gauge cord connections is very important. Inspect the connector and pins for dirt, greases, or for any other thin insulating coatings. Clean with either solvents or by mechanical methods such as with a small rag or with a scraper. A very effective way is to simply disconnect and reconnect the gauge tube and connectors several times allowing the meter pointer to come to rest so that any possible differences can be observed. Many industrial gases will form insulating films on tinned surfaces; however, a gauge tube and cord that remain undisturbed should continue to have good contact.

If a gauge tube is subject to contamination by liquids, its response curve will be altered. If contaminated, it should be washed out with tri-

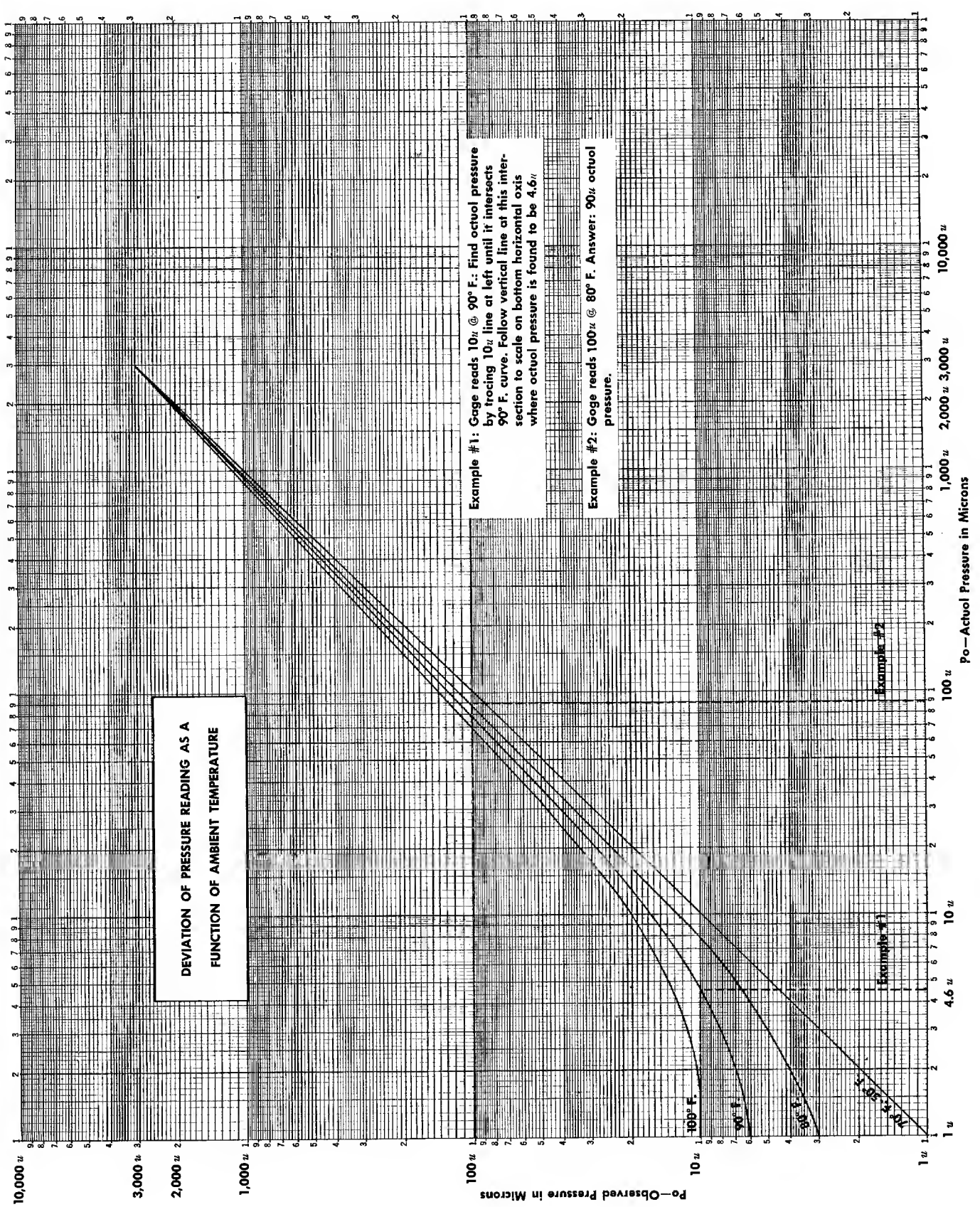


Figure 3. Temperature-Pressure Graph.

chlorethylene to remove oil films, rinsed with acetone, and dried by gentle heating in air for a few minutes.

Allow approximately one minute for initial warm-up. Readings are made without any adjustment of the circuit.

Although the gauge control and tubes are calibrated at 70° F. they may have to operate under different conditions. Readings corrected for temperature are given in figure 3 along with two examples.

Although the KINNEY Gauge Tube fits into any standard octal socket, under no circumstances should it be plugged into any circuit other than the Series KTG circuit designed for it. Permanent damage can be caused by higher than normal voltages which may be found in other gauge circuits.

SERVICING

GENERAL

The general trouble-shooting procedures for the thermocouple gauge are given in figure 4. Wiring diagrams are given in figures 5, 6, and 7.

CAUTION

Do not clean plastic window of meter face with solvents; they cause damage to the plastic. Instead, use a damp soft cloth and mild soap.

CALIBRATION

1. Connect the thermocouple gauge tubes into a vacuum system which is at a pressure less than 10^{-4} torr.

2. Adjust the mechanical zero of the meter, tapping the meter face gently to eliminate the effect of friction on the needle.

3. Plug the control unit into a 115-volt receptacle and turn the control switch to the ON position.

4. The meter should indicate zero microns. If not, a minor adjustment of potentiometer R3 is required.

ADJUSTMENT OF PRE-WARM CIRCUIT

On multiple station gauges, misadjustment of the pre-warm circuit is indicated when the meter needle consistently drifts (up or down) to reach the proper reading when switching stations. To correct this, proceed as follows:

1. Operate the gauge on the system as usual, or connect all gauge tubes to a common vacuum manifold.

2. After the gauge has stabilized, move the station switch to a different position and note the amount of deflection before the needle drifts to the proper reading. Adjust R4 about 1/8 of a turn and move the station switch. Again note the amount of needle deflection. Repeat this process until the amount of needle deflection, when switching from station to station, is acceptable.

REPLACEMENT PARTS

Replacement parts, when required, may be selected from the wiring diagrams in figures 5, 6, and 7. However, it is suggested that the following items be maintained as spare parts for use as necessary:

ITEM	PART NO.
Gauge Tube	200728
Fuse	0.5 amp.
Gauge Cord, 8-feet long	028226

Symptom (Electrical)	Remedy
Meter not illuminated	Fuse blown; replace fuse. Meter lamps burned out; replace lamps.
Meter indicates atmospheric pressure when tube is under vacuum.	Poor gauge cord connection; disconnect and clean contacts. Defective gauge tube; replace tube. Broken gauge tube cord; replace cord. Defective meter; replace meter.
Meter indicates zero at all times.	Defective meter; replace meter. Defective transistor; replace transistor. Defective Zener diode; replace diode.

Figure 4. Trouble-Shooting Chart.

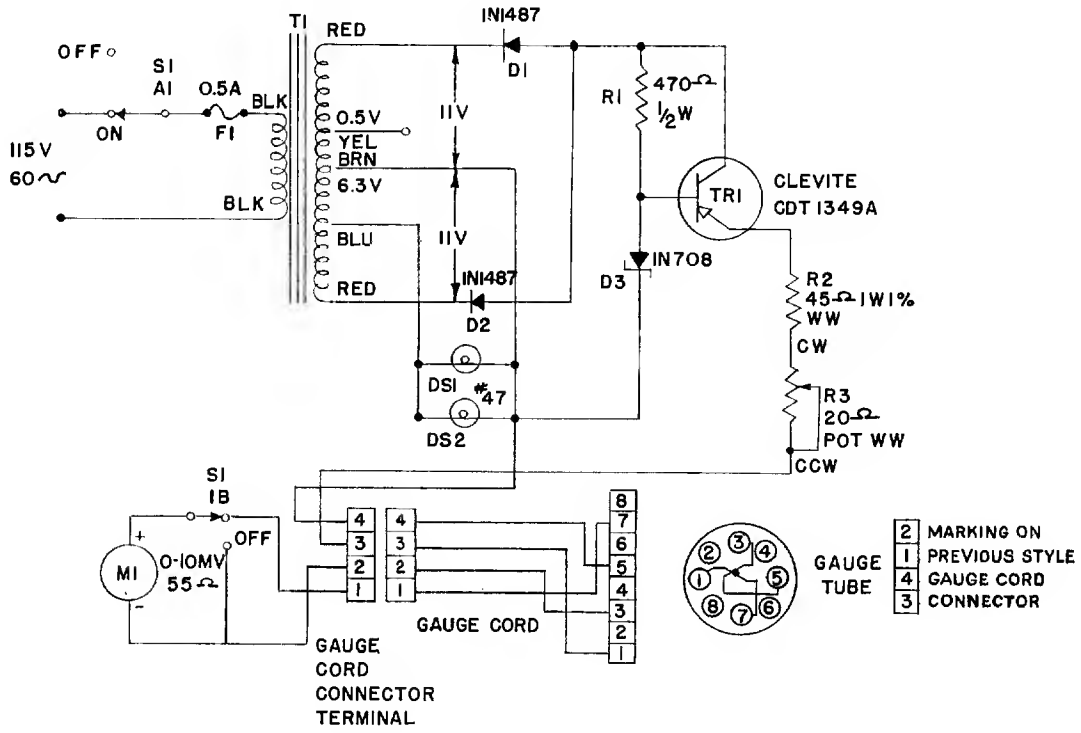


Figure 5. Schematic Diagram, Single Station Gauge.

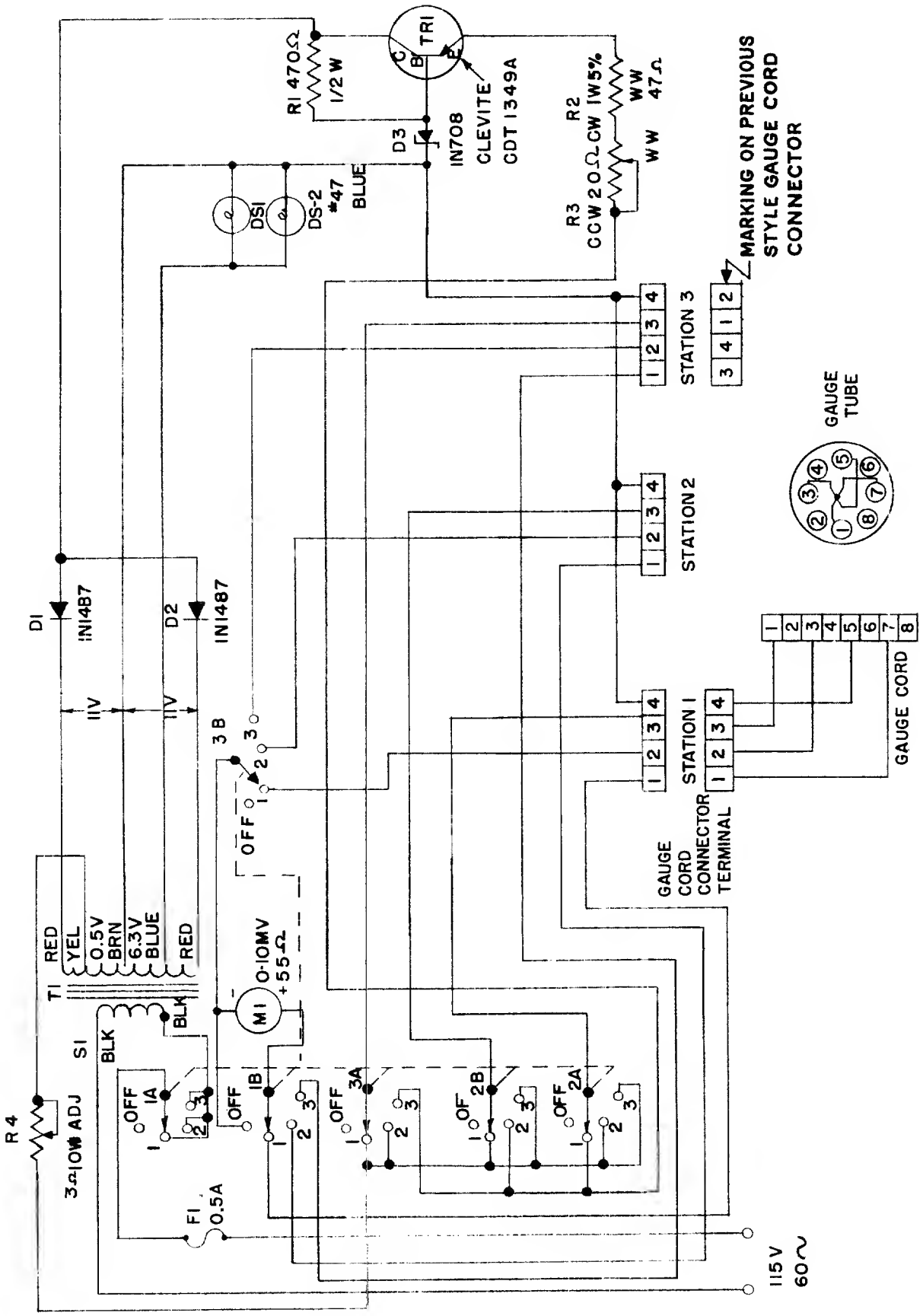


Figure 6. Schematic Diagram, Two and Three Station Gauges.

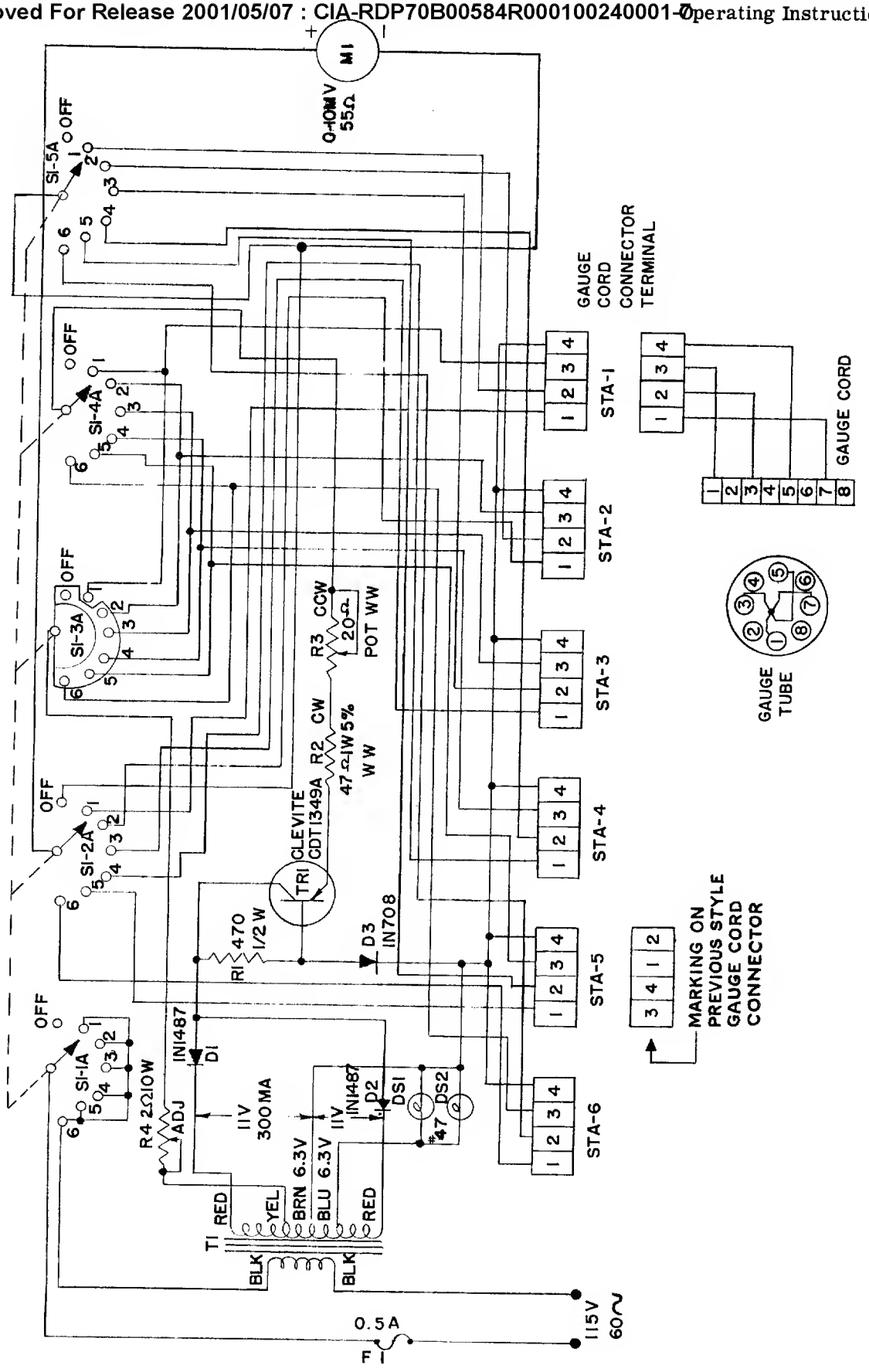


Figure 7. Schematic Diagram, Four, Five, and Six Station Gauges.